the soil-moisture or the water-supply to the filtrating action of belts of woodland.

8. *As regards the Agricultural Productive Capacity of Neighbouring Tracts, and the National-Economic Effect on the Soil generally.*—From an agricultural standpoint, a dry season is much preferable to a low temperature and excessive rainfall. In the former case the crops, although they may be somewhat scanty, are invariably of superior quality. A wet season may produce abundant crops, but they are generally of low quality.

With regard to the influence of forests on the aqueous precipitations throughout central Europe, Prof. Endres makes the following remarks[1]:—

"The question whether woodlands can influence the rainfall is one of the most important from a national-economic point of view. Even if this could be distinctly affirmed, the beneficial action of forests would only be established in the rarest cases, for throughout central Europe at present the number of too wet years exceeds that of dry years. *In districts where the rainfall is over* 40 *inches, any increase is undesirable.*[2] For agriculture very dry years are on the whole less disastrous than extremely wet years. The precipitations of any district are influenced mainly by the position of the mountain ranges with reference to the cardinal points of the compass, by its elevation above sea-level, and its distance from the sea."

But, as the American investigations prove (*idem.* p. 13), "no influence upon the general climate which depends upon cosmic causes can in reason be expected from a forest cover. Only local modifications of climatic conditions may be anticipated, but these modifications, if they exist, are of great practical value, for upon them rest success or failure in agricultural pursuits, and comfort or discomfort of life, within the given cosmic climate. The same condition must be insisted upon with reference to forest influences upon waterflow, which can exist only as local modifications of water conditions, which are due in the first place to climatic, geologic, and topographic conditions."

Even so early as in Roman times it was recognised that too great a clearance of woodland areas brought undesirable changes in the physical conditions of Italy, and affected the welfare of the inhabitants. That the destruction of the ancient forests throughout Great Britain and Ireland, to such an extent that only 3·8 per cent of the total area can now be classified as woodlands (*vide* Parliamentary Report on "Forestry," dated August 5, 1887), was not followed by such disastrous climatic changes as were occasioned by similar causes throughout the Landes, Syria, Asia Minor, Greece, Russia, and many parts of India, we owe entirely to our insular position with its moist climate, and to the happy effects wrought by that portion of the Gulf Stream which reaches our western and southern shores.

Early in the present century, for example, the Agricultural Society of Marseilles reported that in consequence of the reckless destruction of the forests after the revolution of 1789:—

"The winters are colder, the summers hotter, and the beneficial spring and autumn showers no longer fall; the Uveaune, flowing from east to west, rushes down in flood with the least rain, carrying away its banks and flooding the richest pasturage, while, for nine months of the year, its bed lies dry owing to the drying-up of the streams."

To a similar cause also Prof. Geffcken (in *The Speaker* of January 6, 1893) attributes the Russian famine of 1892 in the following terms:—

"We speak of the deficit (in the Russian Budget) of 1893 as certain, and it is easy to show that it will be so. *The principal cause of the present dearth is the drought during the last spring and early summer, and this absence of rain is greatly due to the devastation of the forests.* The area formerly covered with timber was enormous, the woods belonging to the Crown, to the great landed proprietors, and to the village communities. But the means of transport were then so imperfect and costly that only in the neighbourhood of large rivers did the felling of timber pay. This changed with the construction of railways and the abolition of serfdom; the former gave the possibility of selling with profit, and the peasants abandoned their woods to speculators for what they thought a good price, little thinking of the future; the larger proprietors followed their example; the purchase money was spent in drink and luxurious living, and no one thought of replanting. *Too late has the Government issued a law for the protection of forests. Such a devastation going on for* 20 *years not only exhausts a source of wealth, but has also other bad consequences.* When the country is deprived of its trees, the earth is dried up and crumbles from the hills; the water coming down from heaven cannot be kept back as is the case with the woods, which act as a sponge, but rushes in torrents into the rivers and disappears in the sea, and the consequence is a gradual diminution of the fertility of the soil and the disappearing of numerous brooklets and small rivers, to help the larger ones show a low water-mark, which proves prejudicial to the navigation."

This view is confirmed by the special correspondent of the *Times* (*vide* article "Through Famine-stricken Russia" in issue of April 18, 1892), who writes:—

"I have now travelled over most of the famine-stricken provinces, and I have been struck by the sameness of the picture. Everywhere reckless extravagance meets the eye, the forests have been cut away wantonly, the rivers are neglected, the climate is ruined."

Such also appears to have been the opinion of Major Law, Commercial Attaché to the British Embassy at St. Petersburg, as expressed in his "Report on Agriculture in the South-Eastern Provinces of European Russia," commented on in a leading article of the *Times* of September 17, 1892, in the following words:—

"It is said that this gigantic natural tillage farm (*i.e.* the 'black-soil' region) was formerly hedged in by belts of forest, which served the twofold purpose of sheltering it from the desert winds and of increasing the humidity of the climate. It is certain that these forests do not now exist, and that the black-soil country is often scourged by devastating blasts from the steppe, and not infrequently baked by prolonged droughts. The desert winds pile the snow in drifts into winter, which become the source of destructive torrents in the spring. In summer the same winds are so fierce and arid that in the space of a few hours they wither the corn as it stands, while, when they are laden with sands, they smite the soil itself with perpetual barrenness."

All writers, indeed, who have recently published views on this subject, seem agreed as to the main causes of the recent Russian famine.[1]

In order to obtain the full national-economic benefits that are derivable from woodlands, the areas reserved as forests or planted up should be scattered over the face of the country as equally as possible. In all countries where the population is thin, and primeval forest is still to be found, measures with this end in view can easily be carried out without inflicting any apparent hardship on the existing community. But wherever danger from famine is apt to recur from time to time, it would at the same time seem to be worthy of consideration whether it would not be wise to expropriate tracts of the poorer and higher land here and there, and plant them up on a well-considered scheme for the purpose of ameliorating the climatic conditions for man and beast in the future.

J. NISBET.

SCIENTIFIC SERIALS.

American Journal of Science, January.—Researches in acoustics, No. 9, by Alfred M. Mayer. This paper deals with the law connecting the pitch of a sound with the duration of its residual sensation, and with the smallest consonant intervals among simple tones. The residual sound, *i.e.* the sound perceived by the ear after the actual vibration has ceased, was investigated by means of an apparatus consisting of a tuning-fork vibrating close to the opening of a resonator. The nipple of the resonator was placed opposite a hearing-tube leading to the ear, and the sound was interrupted by a rotating perforated disc interposed between the nipple and the opening of the tube. The discs, which were made of mahogany covered with cardboard, had several circles of holes, and intercepted the sound very effectively. The discs were worked by a hand-pulley and fly-wheel, controlled by a clock beating seconds loudly. The residual sensations obtained, by noticing at what speed the sound became continuous, ranged from 0·0231 secs. in the case of Ut_2, frequency 128, to 0·0049 secs. in the case of Ut_5, frequency 1024. The smallest consonant intervals were determined by noticing when the beats coalesced into a smooth tone. The residual sensations deduced from these experiments were found to be about one-third greater than those obtained by the former method.—Petroleum in its relations to asphaltic pavement, by S. F. Peckham. While it has been well known for years that bitumens occur in great variety, the selection of a proper material for softening the asphalt, to the exclusion of others less desirable or wholly unfit, appears to have escaped attention. A properly selected material should enter into chemical union with both the constituents of the bitumen in the asphalt, thereby increasing its adhesive and binding properties upon the other constituents of the mastic. The proportion of bitumen to sand and other non-bituminous ingredients should be as 1 : 9, a larger amount of bitumen making the pavement too soft, and a smaller amount giving too little stability.—The age of the extra-moraine fringe in Eastern Pennsylvania, by E. H. Williams, Junr. All observations tend to the conclusion that there was but one ice age in Pennsylvania, and that a short and recent one.—The internal work of the wind, by S. P. Langley (see Notes).—Post-glacial æolian action in Southern New England, by J. B. Woodworth. This paper treats mainly of the action of blown sand in carving rocks and boulders.

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[1] "Hygienische Bedeutung der Waldluft und des Waldbodens" in vol. xiii. of "Forschungen auf dem Gebiete der Agricultur-Physik," edited by Prof. Wollny, 1890. p. 607.

[2] This is a point of very great importance with reference to the proposals of Mr. Munro Ferguson, M.P. (*Contemporary Review* for October 1892, pp. 521, 522), for planting up the Highlands of Scotland, and Dr. Macgregor's three questions in the House on the same subject on November 13, December 12, and December 19, 1893. For if there be already any tendency towards more rainfall during the summer months than is good for agricultural crops, an extensive increase in the acreage of woodlands in such vicinities is not desirable.

[1] See also the article on "The Penury of Russia" in the *Edinburgh Review* for January 1893 (pp. 17-19), which may be said to contain a summary of the best opinions on the matter.

In the *Botanical Gazette* for November, 1893, we find a paper on the Food of green plants, by Mr. C. R. Barnes, in which he proposes the term *photo-syntax* for the process of formation of complex carbon compounds out of simple ones under the influence of light.—Mr. H. L. Russell continues his account of the Bacterial flora of the Atlantic Ocean in the vicinity of Woods Holl, Massachusetts; and Miss F. D. Bergen, her useful Record of popular American plant names.

THE third and concluding part of vol. vi. of Cohn's *Beiträge zur Biologie der Pflanzen* contains three important papers.—Dr. M. Scholtz describes the changes in position which take place in the flower-stalk of *Cobœa scandens* before and after flowering. It affords the first recorded instance of an organ with complicated anisotropy. During the development of the bud the flower-stalk exhibits strong negative geotropism and positive heliotropism. After the opening of the flower, which is strongly proterandrous, changes take place in the position of the stamens and style which bring the stigma nearly into the position previously occupied by the anthers.—Herr G. Karsten gives further details of the embryology of *Gnetum;* the development of the male, of the imperfect female, and of the perfect female flowers being described in detail. In the perfect female flowers there are always at first several embryo-sacs; and in some species two or three of these remain till the period of fertilisation, and are capable of impregnation. The actual process of impregnation presents some analogy, on the one hand, to that in the Coniferæ, on the other hand to that in the Casuarineæ. The generative nucleus of the pollen-grain divides within the pollen-tube, as in the Coniferæ. The two portions of this nucleus enter the embryo-sac and coalesce with one of its nuclei. In some species secondary embryos are produced.—R. Hegler gives details of experiments on the influence of mechanical traction on the growth of plants.

Bulletins de la Société d'Anthropologie de Paris, Tome iv. (4e Série), No. 10.—The greater part of this number of the *Bulletins* is occupied by the replies of M. J. M. van Baarda to the questions of the Anthropological Society with regard to the island of Halmaheira, or Gilolo, in the Moluccas. M. G. de Mortillet contributes some palæographical notes on the lower valley of the Seine; and MM. E. Fournier and C. Rivière describe the discovery of objects of the Robenhausian period in the Grotto Loubiere, near Marseilles.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 18.—"On the Transformation of Optical Wave-Surfaces by Homogeneous Strain." By Oliver Heaviside, F.R.S.

"On the Reflection and Refraction of Light." By G. A. Schott, formerly Scholar of Trinity College, Cambridge.

Chemical Society, December 21, 1893.—Dr. Armstrong, President, in the chair.—The following papers were read:—Corydaline. Part iii.: Oxidation with potassium permanganate, by J. J. Dobbie and A. Lauder. The authors have investigated corydalinic acid, $C_{11}H_5N(OMe)_4(COOH)_4$, obtained by oxidising corydaline with potassium permanganate.—The properties of α-benzaldoxime and some of its derivatives, by W. R. Dunstan and C. M. Luxmore. Both α-benzaldoxime and its acetyl-derivative may be obtained in the solid state by cooling. The authors are at present examining a number of addition products of the former substance with the halogen acids.—The interaction of acid chlorides and nitrates, by H. E. Armstrong and A. Lapworth.—The freezing points of triple alloys, by C. T. Heycock and F. H. Neville. The existence of a compound of silver and cadmium of the composition $2AgCd$ seems probable from the results of freezing point determinations of mixtures of these metals in tin, lead, or thallium solution. The behaviour of solutions of silver and cadmium in bismuth points to the formation of the compound $4AgCd$. Aluminium and gold appear to form the compound $AuAl_2$ when dissolved together in molten tin.—Synthesis of pentamethylenecarboxylic acid, hexamethylenecarboxylic acid, hexhydrobenzoic acid, and azelaic acid, by E. Haworth and W. H. Perkin, jun. The authors have prepared the acids mentioned above from the products of interaction of a mixture of tetra- and penta-methylene bromides and ethylic sodiomalonate.—The conversion of ortho- into para- and of para- into ortho-quinone derivatives: I. The condensation of aldehydes with β-hydroxy-α-naphthylamine, by S. C. Hooker and W. C. Carnell.—The synthesis of lapachol, by S. C. Hooker. An isomeride of lapachol is obtained by heating an acetic acid solution of hydroxynaphthaquinone with valeric aldehyde and hydrochloric acid.

Geological Society, January 10.—W. H. Hudleston, F.R.S., President, in the chair.—The following communications were read:—On the Rhætic and some Liassic Ostracoda of Britain, by Prof. T. Rupert Jones, F.R.S. The published observations on the occurrence of these Microzoa in the Rhætic and Lower Liassic strata of England, chiefly in Gloucestershire and Somerset, by the Rev. P. B. Brodie, H. E. Strickland, C. Moore, and others, were given; and the various notices of the so-called *Cypris liassica* in various palæontological works were considered. Numerous specimens submitted by the Rev. P. B. Brodie, the Rev. H. H. Winwood, and Mr. E. Wilson, and some few examined in the Geological Society's collection, have been studied, with the result of determining the characters and alliances of *Darwinula liassica* (Brodie) and of six or seven other species found in the same and the associated series of strata. The *Darwinula globosa* (Duff), from Linksfield, Morayshire, was also critically re-examined as one of this interesting series of Rhætic Ostracoda. The other species belong for the most part to *Cytheridea;* thus most of them probably lived in brackish or estuarine waters. The President and Dr. Henry Woodward spoke on the subject of the paper, and the author replied.—Leigh Creek Jurassic Coal-Measures of South Australia: their origin, composition, physical, and chemical characters; and recent subaërial metamorphism of local superficial drift, by James Parkinson. This paper dealt with the lignitic coal of Leigh Creek and associated rocks. Analyses were given, as illustrating comparisons between the Leigh Creek coal and Jurassic and other coal-bearing rocks found elsewhere. The author discussed the origin of the Leigh Creek deposits, and described certain peculiarities noticeable in the superficial materials. The President and Mr. Browne made a few remarks upon the subject of the paper.—Physical and chemical geology of the interior of Australia: recent subaërial metamorphism of Eolian sand at ordinary atmospheric temperature into quartz, quartzite, and other stones, by James Parkinson. South of the Flinders Range fragments of stone of all sizes are found on the ground, the origin of which the author discussed. He maintained that they were formed by subaërial metamorphism of Eolian deposits. A discussion followed, in which the President, Mr. R. D. Oldham, Prof. T. Rupert Jones, Dr. H. Woodward, Mr. Marr, Dr. G. J. Hinde, and Mr. E. T. Newton took part.

Zoological Society, January 16.—Sir W. H. Flower, K.C.B., F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's menagerie during the month of December, 1893.—Mr. Sclater exhibited and made remarks on a drawing of the head of a monkey (*Cercopithecus erythrogaster*) in the Paris Museum, forwarded to him by M. Pousargues, of that institution.—An extract